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The Genus Euthamia in Missouri.

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Having had occasion last January to examine some specimens collected by Mr. Ralph Hoffman about Kansas City in Jackson County, Missouri, my attention was directed to some specimens of EUTHAMIA, which upon a casual inspection might pass for E. GRAMINIFOLIA (L.) Nuttall, a species commonly supposed to occur in this locality, but which upon a closer examination seemed to differ from the description of that species in several important particulars.

No other species of EUTHAMIA being known for this region, and only one other, E. LEPTOCEPHALA (T. & G.) Greene, a low-land species of Arkansas and Louisiana, which extends up the Mississippi Valley to the low, flat, quaternary formation of the southeastern part of the State, it was interesting to note this new accession to the Flora of a region thought to be well covered by a descriptive Manual.

Having in mind always the bare possibility that every strange plant of this region may be an undescribed species, I wrote to Dr. George T. Moore of the Missouri Botanical Garden to kindly loan me volume 5 of Dr. Greene's Pittonia, in which E. GYMNOSPERMOIDES Greene, a species of the high prairies of Kansas and Nebraska, and most probably the species in hand, was described, and my astonishment may be imagined when I saw that Dr. Greene had established the species on plants collected by me in the Indian Territory in 1894, and that I had left my native county where I had collected for many years, to go down to the Indian Territory to collect this most interesting and distinct EUTHAMIA, when it was common on the prairies of the County where I lived.

As none of the writers on EUTHAMIA, Britton in Manual in 1905, Fernald in Rhodora in 1908, Britton in Illustrated Flora in

1913, Small in Flora in 1913, indicate this species for the Indian Territory, the type locality, I had no intimation that it had been collected there, and by myself. Dr. Small does not even mention this species in the first or second edition of his Flora.

Having procured Dr. Greene's fifth volume of Pittonia, which I had not seen before, and also Rhodora, Volume 10, in which Prof. Fernald has revised the species of EUTHAMIA for the New Gray's Manual, I began a careful study of the species found or likely to be found in Missouri, and have studied all the material of these species preserved in the Herbarium of the Missouri Botanical Garden, 9 sheets from the United States National Museum Herbarium, about fifty sheets from the Herbarium of the University of Illinois, that in Mr. Mackenzie's private herbarium in New Jersey, and all that in the Herbarium of the University of Notre Dame, Indiana, for which courtesies I am under obligations to Dr. George T. Moore, Dr. William R. Maxon, Prof. William Trelease, Mr. Kenneth K. Mackenzie and Dr. J. A. Nieuwland, to whom thanks are here returned.

The genus EUTHAMIA is abundantly distinct in aspect and characters from *Solidago*, as may be seen from the following diagnosis:

EUTHAMIA NUTTALL, Gen. 2: 162. 1818.

Erect, paniculately branched herbs, perennial by long root-stocks, with linear or linear-lancolate, entire, or minutely-serrulate, sessile, 1-5 nerved punctate leaves, and very numerous small heads of both tubular and radiate yellow flowers, clustered in the large corymbose, convex or nearly flat-topped inflorescence. Bracts of the involucre obtuse or acutish, or in far western species acute or acuminate, in two sets, the outer 5-14, short, oblong, in about 3 series, the inner 7-14, linear-oblong, in about 3 series, appressed, more or less glutinous or viscid.

Receptacle flattish, fimbrillate, or pilose. Ray-flowers pistillate usually more numerous than the disk-flowers, the rays small, scarcely exceeding the involucre. Disk-flowers perfect. Anthers obtuse at the base. Style-branches with linear-lanceolate appendages. Achenes top-shaped or oblong, villous-pubescent.

Differs from *Solidago* chiefly in the fimbrillate or pilose receptacle and in having the ray-flowers more numerous than the disk-flowers, *Solidago* having an alveolate receptacle with the disk-flowers more numerous than the ray-flowers.

For the Missouri species of EUTHAMIA, I offer the following somewhat detailed key:

1. Stems simple, branched at the top, 9-15 dm. tall, densely short hairy, especially the upper part, the branchlets, pedicels and broad leaves; leaves thinnish, scarcely or obscurely punctate, distinctly 3-ribbed, often with a pair of indistinct lateral nerves; heads sessile or very short pedicelled in capitate clusters in a rather open convex corymb, 18-28-flowered; involucre ovoid-companulate to subcylindric, 4-5 mm. high, its yellowish bracts oblong to oblong-lanceolate, slightly viscid; achenes oblong, villous-pubescent.

1. EUTHAMIA HIRTELLA.

1. Stems simple, branched at the top, 2.5-5 dm. tall, glabrous, or minutely scabrous, especially the upper part, the branchlets, pedicels and leaves; leaves distinctly 1-nerved, sometimes with a pair of indistinct lateral nerves, or the larger sometimes 3-nerved; heads sessile or short pedicelled in capitate clusters in a dense flat-topped or loose convex open inflorescence, 10-16 flowered; involucre subcylindric or subturbinate, 3.5-6.5 mm. high, its mostly straw-colored bracts oblong or linear-oblong; achenes top-shaped or oblong, villous-pubescent. 2.

2. Leaves linear-lanceolate, spreading, 4-8 mm. wide, yellowish, not strongly punctate, not viscid, distinctly 1-nerved, or the lower sometimes with a pair of very indistinct lateral nerves; involucre subturbinate, its straw-colored bracts linear-oblong or the lower oblong, scarcely viscid; heads sessile or short pedicelled in a dense flat-topped inflorescence, 10-13 flowered; achenes top-shaped, villous-pubescent. Species of the lower Mississippi Valley.

2. EUTHAMIA LEPTOCEPHALA.

2. Leaves narrowly linear, 2-10 mm. wide, light green, punctate, glutinous, distinctly 1-nerved, or the larger 3-nerved; involucre subcylindric or subturbinate, its straw-colored bracts linear-oblong, or the lower oblong, blunt, viscid; heads sessile or short-pedicelled in capitate cluster in a rather open, scarcely flat-topped inflorescence 13-16-flowered; achenes oblong, villous-pubescent. Upper Mississippi basin species of the high prairies. 3.

3. Leaves lance-linear, taper-pointed, 2-4 mm wide, or occasionally wider, obscurely punctate on the upper surface, not viscid or but slightly so; involucre 3-4 mm. high, subcylindric; bracts of the involucre unequal, soft, linear, scarcely glutinous; pedicels

subtended by very minute subulate bracts. More northern prairie species.

3. EUTHAMIA MEDIA.

3. Leaves linear-attenuate, acuminate, 2-5 mm. wide, strongly punctate on both faces, more or less viscid; involucre 5-6 mm. high, subturbinate; bracts of the involucre oblong-linear or oblong, blunt, firm, very glutinous; pedicels subtended by linear bracts. Western and Southern prairie species.

4. EUTHAMIA GYMNOSPERMOIDES.

1. EUTHAMIA HIRTELLA Greene, Leaflets, Bot. Obs. and Crit. 1: 180 1906.

If I have interpreted Dr. Greene's species rightly, this is a tall, simple-stemmed plant, branching at the top, 7.5-15 dm. tall, with much the aspect of *Leptilon canadense;* leaves spreading, 7.5-12.5 cm. long, 8-14mm. wide, 3-5-ribbed, at least the midrib conspicuous, the lateral very faint, sparsely to densely short-hairy on both faces. Appears to be a marsh or swamp species. Those who prefer to use *Solidago* for the name of these species may use SOLIDAGO HIRTELLA (Greene) Bush, n. comb. The range of this species is from Massachusetts(?) to Wisconsin, south to Kentucky and Tennessee.[1]

[1]I have concluded with Dr. Greene that EUTHAMIA GRAMINIFOLIA (L.) Nuttall, to which were formerly referred all the species of EUTHAMIA in North America except EE. OCCIDENTALIS, TENUIFOLIA and LEPTOCEPHALA, is a species of the northeastern States and Canada, and I have not seen any specimens from the interior that I could refer to it.

Britton in the Illustrated Flora rays of EUTHAMIA GRAMINIFOLIA, "New Brunswick to Saskatchewan, Alberta, Florida, Nebraska and Wyoming; heads 20-30 flowered." I have not seen any specimens from Saskatchewan, Alberta, Florida, Nebraska or Wyoming that had heads with so many flowers.

Fernald in Gray's New Manual says of *Solidago graminifolia,* "East Quebec to Saskatchewan, New Jersey, Illinois, Missouri and North Carolina; heads 20-30 flowered." I have not seen any specimens from Saskatchewan, Illinois, Missouri, or North Carolina, that had heads with so many flowers.

Small in his Flora says of EUTHAMIA GRAMINIFOLIA, "Nova Scotia to the Northwest Territory, Florida and Kansas; ray-flowers 12-30." I have not seen any specimens from the Northwest Territory, Florida or Kansas that had heads with so many ray-flowers.

Gray in the Flora of North America says of *Solidago lanceolata,* "Canada to Georgia, northwest to Montana." I have not seen any specimens from Georgia or Montana that I thought were this species.

SPECIMENS EXAMINED:

MASSACHUSETTS:

Without definite locality, ex Chapman Herbarium, date not given, Herb. No. 785331, but possibly an error of labeling, as this is the only specimen seen from so far east.

CONNECTICUT:

New Haven, *Eaton*, date not given, Herb. No. 75066;

Norfolk, *Greenman*, September 25, 1910, Herb. No. 737760.

DISTRICT OF COLUMBIA:

Brookland, *Nieuwland*, 1909, N. D. Herb. No. 2188;

Brookland, *Nieuwland*, September 3, 1911, N. D. Herb. No 1654;

Brookland, *Nieuwland*, September 15, 1912, N. D. Herb. No 10325;

Brookland, *Nieuwland*, September 15, 1912, N. D. Herb. No. 10302;

Takoma Park, *Hitchcock*, 1904, U. I. Herb.

MARYLAND:

Ammendale, *Trelease*, September 12, 1880, Herb. No. 75070;

Chevy Chase, *Greene*, October 5, 1905, N. D. Herb. No. 5462;

Woodside Station, *Painter* 1064, September 4, 1904, Herb. No. 75108.

NEW JERSEY:

Passaic, *Woolson*, September, 1871, U. S. Herb.;

Raritan Landing, *Kelsey* 148, September, 1892, U. S. Herb.

PENNSYLVANIA:

Gettysburg, *Glatfelter*, September 16, 1892, Herb. No. 75081;

Gettysburg, *Redfield*, September 12, 1865, Herb. No. 75080;

Harrisburg, *Fritchey*, September 3, 1889, Herb. No. 75076;

Lancaster County, *Eby*, October, 1893, Herb. No. 75320;

Lower Cove, collector not given, August, 1824, the plant marked A on this sheet, Herb. No. 75098;

Mountville, *Eby*, August, 1890, Herb. No. 75131;
York County, *Glatfelter*, October, 1892, Herb. No. 75134.

OHIO:

Berea, *Watson*, September, 1897, Herb. No. 75109;
Burton, *Drushel*, August 13, 1913, Herb. No. 748850.

INDIANA:

Chain Lakes, *Nieuwland*, September 26, 1911, N. D. Herb. No. 2080;
Kosciusco County, *Deam* 1509, August 17, 1906;
Lake Maxinkuckee, *Scovell* and *Clark* 1114, August 9, 1900, Herb. No. 75096;
Michigan City, *Nieuwland*, September 22, 1910, N. D. Herb. No. 702;
Mineral Springs, *Nieuwland*, September 26, 1912, N. D. Herb. No. 10279;
Notre Dame, *Nieuwland*, 1910, N. H. Herb. No. 9492;
Notre Dame, *Nieuwland*, 1910, N. D. Herb. No. 1654;
Notre Dame, *Nieuwland*, August 16, 1908, Herb. No. 742028;
New Albany, *Davis*, September 15, 1909, Herb. No. 75112;
New Albany, *Davis*, September 15, 1909, Herb. No. 75111;
New Albany, *Davis*, September 15, 1909, Herb. No. 75110;
Tamarack, *Nieuwland*, 1910, N. D. Herb. No. 9495;
Tamarack, *Nieuwland*, September 22, 1910, N. D. Herb. Herb. Vo. 732;
Wells County, *Deam* 465, August 27, 1905, Herb. No. 75116.

MICHIGAN:

Detroit, *Glatfelter*, date not given, the plant marked A on this sheet, Herb. No. 75046;
St. Clair County, *Dodge*, 1880, Herb. No. 75045.

WISCONSIN:

Milwaukee, *Lapham*, 1843, Herb. No. 75042.

KENTUCKY:

Edmonson County, *Price*, September, 1897, Herb. No. 75124;
Edmonson County, *Price*, September, 1897, Herb No. 75093.

ILLINOIS:

Algonquin, *Nason*, September 4, 1878, U. I. Herb.;
Belleville, *Engelmann*, August, 1845, Herb. No. 75,117;
Carlinville, *Andrews*, July 29, 1891, U. I. Herb.;
Evanston, *Sherff*, September 20, 1910, Herb. No. 75,003;
Graceland, *Pammel*, August 18, 1887, Herb. No. 75,068;
Lake Forest, *Jensen*, September, 1896, Herb. No. 75,130;
Lake Villa, *Gleason* and *Shobe* 204, August 9, 1906, U. I. Herb.;
Lake Villa, *Gleason* and *Shobe* 212, August 9, 1906, U. I. Herb.;
Mascoutah, *Welsch*, 1862-1871, U. I. Herb.;
Peoria, *Brendel*, date not given, U. I. Herb.;
Peoria, *McDonald*, August, 1887, U. I. Herb.;
Princeville, *Chase*, 754, August 24, 1900, U. I. Herb.;
Taylorville, *Andrews*, August 20, 1898, U. I. Herb.;
Tracy, *Greenman*, August 22, 1908, Herb. No. 721,717;
Tracy, *Greenman*, August 22, 1908, Herb. No. 740,596;
Wady Petra, *Chase*, September 5, 1896, U. I. Herb.;
Wady Petra, *Chase* 679, October 28, 1900, U. I. Herb.;
Winnetka, *Sherff*, September 8, 1912, Herb. No. 75,002;
Winnetka, *Sherff* 1911, September 8, 1912, U. I. Herb.

TENNESSEE:

Richland Station, *Gattinger*, August 27, 1883, Herb. No. 75072;
Sumner County, *Eggert*, September 17, 1897, Herb. No. 75125.

No specimens of this species have been seen from Missouri, but its range must include Eastern Missouri, and the Belleville, Illinois, collection, shows that this species reaches the Mississippi River bottoms.

2. EUTHAMIA LEPTOCEPHALA (T. & G.) Greene, Mem, Torr. Club 5: 321. 1894.

Solidago leptocephala T. & G. Fl. N. A. 2:226. 1841.

Solidago leptocephala T. & G., Bush in Plants of Southeastern Missouri, No. 176.

Missouri to Louisiana and Texas, according to Britton in Illustrated Manual, which is correct.

East Nebraska to Mississippi and Texas, according to Fernald

in Gray's New Manual, but the East Nebraska reference must be a mistake, as this lowland species does not get up to Nebraska.

West Louisiana and Texas, in a narrow-leaved form from Northwestern Arkansas, *Harvey*, according to Gray in the Flora of North America, but the northwestern Arkansas reference must refer to some other species, most probably E. GYMNOSPERMOIDES.

A species of the low alluvial bottoms of the lower Mississippi River valley, north to Southeastern Missouri and Southern Illinois west to Texas.[1]

First collected by *Bush*.

SPECIMENS EXAMINED:

MISSOURI:

Butler County, *Bush* 3704, October 15, 1905, Herb. No. 75106;

Butler County, *Bush* 3704, October 15, 1905, U. S. Herb. No. 492092;

Butler County, *Bush* 3704A, October 15, 1905, Herb. No. 75004;

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[1] Allied to E. LEPTOCEPHALA and yet abundantly distinct from it, is a plant of the Southeastern States, which may be disposed of as

EUTHAMIA FASTIGIATA Bush, n. sp.

Stems simple, fastigiately branched at the top, striate, smooth and shining, 6-8 dm. tall; branches, branchlets and pedicles somewhat seabrous; leaves 3-6 cm. long, 3-6 mm. wide, minutely punctate on the upper surface, minutely seabrous on the lower, minutely serrulate on the margins, 1-ribbed, or with a pair of indistinct lateral nerves, or the larger 3-5-nerved; inflorescence a flat-topped corymb; heads more or less loosely pedicelled, about 3.5 mm. high, sub-cylindric, 16-18 flowered; bracts of the involucre in several series, yellow, ovate to ovate-oblong, the inner soft and thin; achenes top-shaped, minutely pubscent.

Apparently a plant of the lowlands, confined to the Southeastern States, allied also to E. CHRYSOTHAMNOIDES Greene, of Arkansas and Louisiana, but very distinct.

SPECIMENS EXAMINED:

NORTH CAROLINA:

Biltmore, BILTMORE HERBARIUM, 993b, August 23, 1897, Herb. No. 75054, TYPE.

FLORIDA:

Jacksonville, *Curtiss* 5347, October 1, 1894, Herb. No. 75062;

Jacksonville, *Curtiss*, 1349, October, N. D. Herb. No. 6333.

VIRGINIA:

White Sulphur Springs, *Mackenzie* 495, September 7, 1903.

For those who prefer the name *Solidago* for these species, I offer SOLIDAGO FASTIGIATA Bush, n. sp., as the name of this plant.

Campbell, *Bush*, October 26, 1892, Herb. No. 75019;
Campbell, *Bush*, October 26, 1892, Herb. No. 75038;
Campbell, *Bush*, October 26, 1892, Herb. No. 75017;
Campbell, *Bush* 6369, October 7, 1910, Herb. No. 75009;
Campbell, *Bush* 6369, October 7, 1910, U. S. Herb. No. 672974;
Dunklin County, *Bush*, October 26, 1892, Herb. No. 75039;
Poplar Bluff, *Letterman*, date not given, Herb. No. 774234.

ARKANSAS:
Arkansas Post, *Kellogg*, September 23, 1909, Herb. No. 75313;
Greene County, probably Paragould, *Eggert*, September 26, 1983, Herb. No. 75016;
Greene County, probably Paragould, *Eggert*, September 26, 1893, Herb. No. 75020;
Greene County, probably Paragould, *Eggert*, September 26, 1893, Herb. No. 759862;
Moark, *Bush* 3664, October 15, 1905, Herb. No. 75107;
Moark, *Bush* 3664A, October 15, 1905, Herb. No. 75005;
Moark, *Palmer* 4791, October 31, 1913, Herb. No. 717310;
Paragould, *Eggert*, October 26, 1917, Herb. No. 720505;
Peach Orchard, *Letterman*, date not given, Herb. No. 77433
Peach Orchard, *Letterman*, date not given, Herb. No. 774339;

MISSISSIPPI:
Panola, *Eggert*, September 16, 1896, Herb. 75018;
Without definite locality, *Hilyard*, 1858, Herb. No. 75010.

LOUISIANA:
Pointe a la Hache, *Langlois*, November 6, 1885, Herb. 75022;
Without definite locality, *Buckley*, September 18, Herb. No. 75068.

TEXAS:
Columbia, *Bush* 320, November 1, 1889, Herb. No 75034;
Dallas, *Reverchon*, September, Herb. No. 75035;
Dallas, *Reverchon* 1323, N. D. Herb. No. 6314;
Dallas, *Reverchon* 446, September, 1880, Herb. No. 75033
Dallas, *Reverchon*, September, Herb. No. 75030;

Grand Saline, *Reverchon* 2050, October 18, 1900, Herb. 75032;
Houston, *Lindheimer*, September, 1842, Herb. No. 75014;
Hutchinson County, *Carleton* 427, August, 1891, U. I. Herb.;
Industry, *Lindheimer*, September, 1844, Herb. No. 75011;
Industry, *Lindheimer*, September, 1844, Herb. No. 75036;
Miller's Ferry, near Dallas, *Reverchon*, October, 1877, Herb. No. 75021;
Pierce, *Tracy* 7327, September 14, 1901, Herb. No. 75031;
Rosenberg, *Palmer* 6639, September 25, 1914, Herb. No. 75009;
Texarkana, *Heller* 4258, September 15, 1898, Herb. No. 75053;
Texarkana, *Heller* 4258, September 15, 1898, U. I. Herb.;
Texarkana, *Letterman*, October 19, 1894, Herb. No. 75014;
White Oak Bayou, *Lindheimer*, September, 1842, Herb. No. 75012;
Without definite locality, *Lindheimer*, 1843, Herb. No. 75037.

3. EUTHAMIA MEDIA Greene, Pittonia 5:74. 1902.
Solidago Moseleyi Fernald, Rhodora 10:93. 1908.
Euthamia Moseleyi Fernald, Rhodora 10:93. 1908.

Solidago lanceolata L., Bush in Flora of Jackson County Missouri, No. 231, 1882, in great part and including E. GYMNOSPERMOIDES; Tracy in Flora of Missouri, No. 616, 1886; Eggert in Catalogue of Plants of Saint Louis, Missouri, 1891.

Solidago tenuifolia Pursh, Bush in Flora of Jackson County, Missouri, No. 688, 1885, in small part, mostly E. GYMOSPERMOIDES; Tracy in Flora of Missouri, No. 632, 1886, mainly E. GYMNOSPERMOIDES.

EUTHAMIA GRAMINIFOLIA (L.) Nutt., Mackenzie and Bush in Manual of the Flora of Jackson County, Missouri, 1902, as to description, but including E. GYMNOSPERMOIDES.

Not mentioned by Britton in Illustrated Flora, Fernald in Gray's New Manual, but from the description is Fernald's *Solidago Moseleyi*.

No species of EUTHAMIA is given by Dr. Daniels in his Flora of Columbia, Missouri.

Illinois and Missouri, southward, according to Greene, l. c.

First collected by *Engelmann*.

I have concluded that the prairie plant of Ohio, Indiana, Illinois, Missouri, Iowa and Michigan belongs to Dr. Greene's species, and I have been unable to distinguish Fernald's *Solidago Moseleyi* from it. If we are to accept Dr. Greene's E. GYMNOSPERMOIDES which has been generally included in E. GRAMINIFOLIA, E. TENUIFOLIA and E. LEPTOCEPHALA, as a valid species, E. MINOR Greene, and E. FLORIBUNDA Greene (the last having been accepted by Fernald in Gray's New Manual as a species in *Solidago*, may be known as SOLIDAGO FLORIBUNDA (Greene) Bush, n. comb., if these species are finally placed in *Solidago*), it seems to me very reasonable to accept this species, and several others of Dr. Greene's, than try to keep it in E. GRAMINIFOLIA, from which it differs in several important characters, notably the fewer-flowered heads.[1]

If the species of EUTHAMIA are to be included in *Solidago*, this species will take the name SOLIDAGO MEDIA (Greene) Bush, n. comb.[2]

[1] EUTHAMIA CAMPORUM Greene, of the far West and Northwest, seems distinct from E. MEDIA in the firm, almost coriaceous leaves, which are strongly punctate on both faces. If this species is to be referred to *Solidago*, it should bear the name SOLIDAGO CAMPORUM (Greene) Bush, n. comb. Amongst the many specimens of this species examined, I refer the following:

KANSAS:

Riley County, *Norton*, 231, September 13, 1895, Herb. No. 75294.

[2] I have not been able to see many specimens of EUTHAMIA REMOTA Greene, but the few I have seen were sufficient to cause me to believe that this species is very distinct from E. TENUIFOLIA, to which it has been referred by Britton in Illustrated Flora, and perhaps by Fernald in Gray's New Manual, and Small in his Flora. This belongs to the E. TENUIFOLIA group, with upper leaves 1-ribbed, the lower often with a pair of indistinct lateral nerves, but the leaves are much longer and wider, do not droop, and the involucre is cylindrical in shape, and attenuate at the base. In aspect it resembles E. MEDIA on the one hand, and on the other E. TENUIFOLIA, but is *remote* from both of these species. Like E. HIRTELLA, this species is also a lake region species. The thickish, oblong-linear bracts, in several series, with thick green tips, alone separates this species from E. TENNIFOLIA.

Of the few sheets of specimens examined, I feel certain of the following:

ILLINOIS:

Chicago, *Glatfelter*, August 20, 1893, Herb. No. 75312.

INDIANA:

Dune Park, *Chase* 278, September 19, 1898, U. I. Herb.;

Dune Park, *Greenman*, 2692, September 11, 1908, Herb. No. 740564;

This seems abundantly distinctive from EUTHAMIA NUTTALLII Greene (or if accepted as a valid species in *Solidago*, SOLIDAGO NUTTALLII (Greene) Bush, n. comb.), a species of the middle Atlantic slope, although it varies much in the length and width of the leaves.

SPECIMENS EXAMINED:

INDIANA:

Dune Park, *Chase* 521A, August 27, 1897, Herb. No. 75060;
Miller's, *Nieuwland*, September 28, 1911, N. D. Herb. No. 9534;
Mineral Springs, *Nieuwland*, September 22, 1910, N. D. Herb. No. 733;
Mineral Springs, *Nieuwland*, September 22, 1910, N. D. Herb. No. 733;
Mineral Springs, *Nieuwland*, September 26, 1912, N. D. Herb. No. 10280;
Mineral Springs, *Nieuwland*, September 26, 1912, N. D. Herb. No. 10280;
Noter Dame, *Nieuwland*, 1909, N. D. Herb. No. 2247;
South Bend, *Nieuwland*, August 27, 1912, Herb. No. 742057;
Tamarack, *Nieuwland*, August 20, 1912, Herb. No. 720022.

ILLINOIS:

Algonquin, *Nason*, September 14, 1878, U. I. Herb.;
Berwyn, *Calkins*, September, 1907, N. D. Herb. No. 5463;
Carlinville, *Andrews*, September 18, 1889, U. I. Herb.;
Carlinville, *Andrews*, September 14, 1890, U. I. Herb.;
Carlinville, *Andrews*, September 25, 1982, U. I. Herb.;
Champaign County, *Clinton*, September, 1895, U. I. Herb.;
Champaign County, *Hays*, September, U. I. Herb.;
Champaign County, *Percival*, September 14, 1876, U. I. Herb.;

Dune Park, *Greenman*, September, 1908, Herb. No. 742193;
Indiana Harbor, *Deam* 5286, August 30, 1908, determinod by Greene as EUTHAMIA REMOTA;
Lake Maxinkuckee, *Scovell* and *Clark* 1431, 1900, Herb. No. 75333;
Miller's, *Greenman*, August 20, 1908, Herb. No. 742191.

Chicago, *Engelmann*, September, 1840, Herb. No. 75440;
Chicago, *McDonald*, September, 1893, U. I. Herb.;
Chicago, *Sherff*, 1765, August 24, 1912, Herb. No. 75316;
Chicago, *Sherff* 1765, August 24, 1912, U. I. Herb.;
Decatur, *Clokey*, September, 1898, U. I. Herb.;
Kankakee, *Sherff* 1765, August 24, 1912, Herb. No. 75315;
Mascoutah, *Welsch*, 1862-1871, U. I. Herb.;
Myra, *Clinton*, August 29, 1899, U. I. Herb.;
Oquawka, *Patterson*, September, 1876, TYPE, Herb. No. 75126;
Peoria, *Brendel*, date not given, U. I. Herb.;
Wady Petra, *Chase*, September 21, 1895, Herb. No. 75332;
Waukegan, *Gleason* and *Shobe* 361, August 16, 1906, U. I. Herb.;
Without definite locality, *Mead*, September, 1848, Herb. No. 75300;
Woodford County, *Brendel*, September, 1858, U. I. Herb.;
Yates City, *McDonald*, September, 1893, U. I. Herb.

MISSOURI:

Allenton, *Letterman*, August 25, 1895, Herb. No. 775495;
Dodson, *Bush*, 362, September 26, 1897;
Dodson, *Mackenzie* 806, September 18, 1895, Herb. No. 75101;
Eolia, *Davis*, 1352, August 30, 1915, Herb. No. 794746;
Eolia, *Davis* 551, August 30, 1915;
Independence, *Bush* 3, 1882, Herb. No 75120;
Jackson County, *Bush*, September 3, 1888, Herb No. 75100;
Jackson County, *Bush* 216, October 8, 1893, Herb. No. 75103;
Jackson County, *Bush* 216, October 8, 1893, U. S. Herb. No. 49271;
Oakwood, *Davis* 1325, October 4, 1911, Herb. No. 708957;
Oakwood, *Davis* 297, October 10, 1911, Herb. No. 762164;
Oakwood, *Davis* 3297, October 9, 1914, Herb. No. 765854;
Oakwood, *Davis* 7303, September 11, 1915;
Oakwood, *Davis* 7307, September 11, 1915;
Oakwood, *Davis* 6098, September 11, 1915, Herb. No. 797842;

Oakwood, *Davis* 6046, September 24, 1915, Herb. No. 796509;
Oakwood, *Davis* 6046, September 24, 1915, Herb. No. 787342;
South Webster, *Eggert*, October 4, 1877, Herb. No. 75127;
South Webster, *Eggert*, October 4, 1877, Herb. No. 75128;
South Webster, *Eggert*, October 11, 1877, Herb. 75129;
South Webster, *Eggert*, October 11, 1877, Herb. No. 75105;
South Webster, *Eggert* October 11, 1877, Herb. No. 720237;
St. Louis, *Engelmann* 617, September, 1833, Herb. No. No. 75040;
St. Louis, *Glatfelter*, September 19, 1897, Herb. No. 75133;
Waldo Park, *Hoffman*, September 21, 1916;
Whiteside, *Davis* 661, September 20, 1915;
Whiteside, *Davis* 6004, September 20, 1915, Herb. No. 796490;
Whiteside, *Davis* 6004, September 20, 1915, Herb. No. 787344;
Whiteside, *Davis*, 6056, September 20, 1915, Herb. No. 787345;
Whiteside, *Davis* 6056, September 20, 1915, Herb. No. 796489;
Whiteside, *Davis* 6083, September 20, 1915, Herb. No. 797823;
Whiteside, *Davis* 6083, September 20, 1915, Herb. No. 787343;
Whiteside, *Davis* 8244, September 20, 1915;
Whiteside, *Davis* 1710, September 17, 1916;
Whiteside, *Davis* 1962, September 17, 1916;
Whiteside, *Davis* 1857, September 18, 1916;
Without definite locality, *B. Frank*, 1837, Herb. No. 75098; this sheet bears label which reads "*Bacharis angustifolia* Mx. Unio itiner. 1837. In civitate Missouri. leg. b. Frank," which shows that the collector took this plant to be different from *Solidago lanceolata* L., but was in error in referring it to *Baccharis*, which does not occur anywhere near Missouri.
Without definite locality, *Engelmann*, date not given, Herb. No. 75041.

IOWA:

Ames, *Pammel*, September 10, 1897, Herb. No. 75049;

Decatur County, *Anderson*, September 19, 1904, Herb. No. 75114;

Decatur County, *Fitzpatrick* 86, September 8, 1898, Herb. No. 75052;

Muscatine, *Mackenzie* 275, September 3, 1892;

Muscatine, *Pammel* and *Reppert* 1206, September 10, 1912, Herb. No. 75083;

NEBRASKA:

Lincoln, *Webber*, September, 1887, Herb. No. 75281;

St. Helena, *Bruhin*, date not given, Herb. No. 75280;

MINNESOTA:

Lake Carlos, *Ross*, July 1, 1891, Herb. No. 770969;

Lake Chesago, *Wislizenus* 538, August 14, 1886, Herb. No. 75048;

Minneapolis, *Herrick*, July 28, 1878, Herb. No. 774334.

WISCONSIN:

Kenosha, *Gates*, August 30, 1909, U. I. Herb.

4. EUTHAMIA GYMNOSPERMOIDES Greene, Pittonia 5:75. 1902.

Solidago gymnospermoides (Greene) Fernald, Rhodora 10: 93. 1908.

EUTHAMIA GRAMINIFOLIA (L.) Nutt., Mackenzie and Bush in Manual of the Flora of Jackson County, Missouri, in small part, 1902; Palmer in Catalogue of Plants of Jasper County, Missouri, Nos. 91 and 196, 1913.

Solidago lanceolata L., Bush in Flora of Jackson County, Missouri, in small part, No. 231, 1882.

Solidago tenuifolia Pursh, Bush in Flora of Jackson County, Missouri, in large part, No. 688, 1885; Tracy in Flora of Missouri, No. 632, 1886; Shepard in List of Greene County Plants.

EUTHAMIA TENUIFOLIA Pursh, of Whipple's report, according to Greene, l. c.

East Kansas to Louisiana and Texas, according to Fernald in Gray's New Manual, but the Louisiana part of the range must belong to some other species.

Nebraska, Kansas, Texas and Louisiana, according to Britton in Illustrated Flora, but I have not seen any specimens from so far north as Nebraska, or from Louisiana.

Not mentioned by Small in his Flora, second edition.

Antelope Hills of the Canadian, *Bigelow*, according to Greene, l.c.

Cherokee Nation, *Blankinship*, August 15, 1875, according to Greene, l. c.

Very different from E. LEPTOCEPHALA, and in aspect strongly recalling the Mexican genus *Gymnosperma*, Greene, l. c.

Dr. Greene neglected to fix the type, which was based on my No. 252.

In a narrow-leaved form from northwestern Arkansas, *Harvey*, according to Gray in Flora of North America, in citingthe range of *Solidago leptocephala*.[1]

First collected by Broadhead.

This is a species of the high prairies of Missouri, Kansas, Indian Territory and Texas.[2]

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[1] A plant of the lowlands of Southern Arkansas and Louisiana has been described by Dr. Greene as E. CHRYSOTHAMNOIDES. It is a taller plant, more slender, with corymbose inflorescence, longer heads with firm bracts. I have examined the type specimens collected by Letterman, and the species has little affinity with E. GRAMINIFOLIA, to which it has been referred, but is more nearly related to E. GYMNOSPERMOIDES. If this is a valid species, and is to be placed in *Solidago*, I propose SOLIDAGO CHRYSOTHAMNOIDES (Greene) Bush, n. comb. for this species.

Dr. Small does not mention this species in his Flora, second edition.

[2] An anomalous species of the far West and Northwest, which seems to have no close affinity with any of the known species of EUTHAMIA, I propose as

EUTHAMIA BRACTEATA Bush, n. sp.

Stems 4-6 dm. tall, striate, smooth and glabrous; leaves oblong-lanceolate, thin, deep green, more or less spreading, very wide, the widest of any species known to me, according to their length, 4-6 cm. long, 6-12 mm. wide, smooth on both faces, minutely serrinate on the edges all around, 3-nerved, the midvein conspicuous, the lateral nerves indistinct, neither viscid nor punctate; branches, branchlets and pedicles sharply angular, somewhat scabrous; heads mostly pedicelled or 2-3 in sessile capitate clusters, arranged in a dense contracted, rounded corymb, 16-20 flowered, 5-5.5 mm. high; involucre broadly campanulate, its bracts in several series, broadly ovate, thin, yellow, with scarious edges, very conspicuous, minutely ciliolate, rounded at the tips, not viscid nor glutinous; achenes oblong, appressed-pubescent.

SPECIMENS EXAMINED:

COLORADO:

Cañon City, *T. S. Brandegee* B532, 3072, month not given, 1872, TYPE, Herb. No. 75079. This sheet has penciled on it this, "'Porter SAY

SPECIMENS EXAMINED:

MISSOURI:

Cass County, *Broadhead*, September 6, 1864, Herb. No. 75306;

Cass County, *Broadhead*, September 6, 1864, Herb. No. 75308;

Golden City, *Palmer* 4587, October 6, 1913, Herb. No. 717285;

Jasper County, *Trelease*, September 18, 1898, Herb. No. 75309;

Lee's Summit, *Mackenzie* 328, September 18, 1898;

Springfield, *Standley* 9123, August 21, 1912, U. S. Herb. No. 688042;

Springfield, *Standley*, September, 1905, U. S. Herb No. 735548;

Strafford, *Standley* 9458, August 27, 1912, U. S. Herb. No. 688374;

Waldo Park, *Hoffman*, September 15, 1916;

Webb City, *Palmer*, 91, September 30, 1901, Herb. No. 75104;

Webb City, *Palmer* 196, September 30, 1901, Herb. No. 762156.

KANSAS:

Manhattan, *Norton*, September, 1893, Herb. No. 75043.

OKLAHOMA:

Alva, *Stevens* 2807, September 20, 1913, Herb. No. 782062;

Alva, *Stevens* 2807, September 20, 1913, U. I. Herb;

Alva, *Stevens* 2881, October 5, 1913, U. I. Herb.;

S. occidentalis J. & G., but heads not pedicelled *nor* involucral scales linear-lanceolate or acute. Perhaps a connecting link. Eaton agrees with me that it is *S. lanceolata*. J. H. R(edfield)." Evidently this specimen has given several persons much trouble trying to put it into some described species.

ALBERTA:

Rosedale, *Marion E. Moodie* 1187, August 10, 1915, Herb. No. 800171.

WYOMING:

Beaver Creek, *Aven Nelson* 8558, July 21, 1901, Herb. No. 75097.

NORTH DAKOTA:

Leeds, *Lunell*, August 6, 1905.

For those who consider EUTHAMIA as only a subgenus of *Solidago*, I offer the name SOLIDAGO BRACTEATA Bush, n. sp. for this plant.

Cherokee Nation, *Blankinship*, August 19, 1895, Herb. No. 75088;
Sapulpa, *Bush* 250, September 19, 1894, Herb. No. 75024;
Sapulpa, *Bush* 251, October 3, 1894, Herb. No. 75026;
Sapulpa, *Bush* 252, October 6, 1894, TYPE, Herb. No. 75025;
Tulsa, *Stevens* 2986, October 10, 1913, U. I. Herb.;
Tulsa, *Stevens* 2986, October 10, 1913, Herb. No. 781160;
Vinita, *Bush* 245, September 18, 1894, Herb. No. 750-3;a
Without definite locality, but probably Limestone Gap, *Butler*, 1871, Herb. No. 75304;
Without definite locality, *Waugh*, date not given, Herb. No. 75029;
Without definite locality, *Waugh*, date not given, Herb. No. 75027.

NEW MEXICO:
Crossing of the Arkansas, *Fendler* 351, September 3, 1847, Herb. No. 75043.

TEXAS:
Columbia, *Bush* 1552, October 17, 1900, Herb. No. 75113;
Hadley, *Reverchon* 1475, September, 1878, Herb. No. 75084;
Houston, *Lindheimer* 82, October, 1842, Herb. No. 75301;
No state Given, *Trelease*, no date given, Herb. No. 75102.[1]

[1] A few remarks on the status and distribution of EUTHAMIA TENUIFOLIA may be very appropriate here, inasmuch as this species has been but little understood, and has been assigned a range that is not supported by the material studied by me. I find many collections labeled *Solidago tenuifolia* or EUTHAMIA TENUIFOLIA from Missouri, and from many States in the interior, and the specific name is given in many reports and lists of plants. In one lot alone of less than 70 sheets, I found 15 or 16 different species, all bearing the name *Solidago tenuifolia* or EUTHAMIA TENUIFOLIA.

Britton in the Illustrated Flora in 1913, Fernald in Gray's New Manual in 1908, and Small in his Flora in 1913, all agree that this species occurs in the interior, in Illinois, Northern Indiana, Southern Wisconsin and locally in the interior.

Britton in the Illustrated Flora in 1913, says of this species, "Massachusetts to Illinois, Wisconsin, Florida and Louisiana." The Illinois, Wisconsin, Florida and Louisiana part of the range must belong to other species, as I have not seen any specimens of this species from those States.

Fernald in Gray's New Manual in 1908, says of *Solidago tenuifolia*, "East Massachusetts to Florida; also in Northern Indiana and Southern Wisconsin." I have not seen any specimens of this species from Indiana,

Wisconsin or Florida, and there are no specimens from Wisconsin in the Gray Herbarium.[1]

Small in his Flora, second edition, in 1913, says of EUTHAMIA TENUIFOLIA, "Massachusetts, Florida and Texas, and locally in the interior." Evidently Dr. Small followed Britton and Fernald in assigning this species to the Lake region of the interior, but I have not seen any specimens from the interior, nor from Florida or Texas.

Gray in Flora of North America in 1884, says of *Solidago tenuifolia*, "New England to Florida and Texas," the range being thus restricted to the sea-coast, but I have not seen any specimens of EUTHAMIA TENUIFOLIA from Florida or Texas. Dr. Gray evidently included specimens of E. MINOR and E. PULVERULENTA in *Solidago tenuifolia*.

From a careful study of a large amount of material of EUTHAMIA TENUIFOLIA and allied species, at my disposal, I have come to the conclusion that Britton, Fernald and Small have based the isolated interior occurrence of this species on specimens of *Solidago Moseleyi*, EUTHAMIA MEDIA and E. REMOTA. After more than thirty-five years acquaintance with this species, it is relegated to the range given it by Dr. Gray in 1880, which is that of a sea-coast species.

Having studied this species somewhat critically, it is with some confidence that I refer the following specimens to it.

MASSACHUSETTS:

Cape Cod, *Fritchey*, August 17, 1889, Herb. No. 75290;
Cape Cod, *Greenman* 410, September 4, 1890, Herb. No. 738578;
Norquit, *Sturtevant*, August 24, 1888, Herb. No. 75280;
Sharon, *Greenman* 345, October 17, 1897, Herb. No. 738543;
Southwick, *Seymore* 275, September 16, 1914, Herb. 789740;
Woods Hole, *Trelease*, September 16, 1881, Herb. No. 75282.

LONG ISLAND:

Eastport, collector not given, September 14, 1914, Herb. No. 75,278;
Hempstead Plains, *Schrenk*, September 7, 1893, Herb. No. 75277;
Woodhaven, *Hulst*, September 10, 1891, U. I. Herb.

RHODE ISLAND:

Kingston, *Morong*, August 21, 1879, Herb. No. 75319;
Narragansett River, *Englemann*, August 20, 1879, Herb. No. 75310;

[1] In a letter to the writer dated March 2, 1917, Mr. S. F. Blake says, "Dr. Robinson has handed me your letters regarding *Solidago tenuifolia* with the request that I look up the matter for you. I find only two sheets of this species from the interior in the Gray Herbarium. These are "'Prairies of Illinois, *Dr. Mead*'" and "'Moist prairie, Roby, Indiana, 20, Sept. 1906. *O. E. Lansing, Jr.* No. 2648.'" I do not see that these specimens differ in any essentials from material from Massachusetts and New Jersey. There is no material from Wisconsin in the herbarium."

I have not seen the specimens collected by Lansing, and therefore can not say what they are, but the probability is very great that they are E. MEDIA. I have, however, examined several sheets of Dr. Mead's collection from "Prairies of Illinois," and these are all E. MEDIA. There appears no sufficient reason for citing E. TENUIFOLIA from Southern Wisconsin, as no specimens are known from there, and as Illinois is not given in the Manual as part of the range of this species, I maintain that not only this State, but Indiana also be taken from the range of this species.

CONNECTICUT:
Hartford, *Smith*, August, 1886, Herb. No. 75279;
Southington, *Bissell* 1548, September 8, 1897, Herb. No. 75311;
Stratford, *Eames*, September 8, 1892;
Stratford, *Eames*, September 14, 1892.

NEW JERSEY:
Atco, *Brinton*, October 5, 1888, Herb. No. 774343;
Camden, *Martindale*, September 14, 1873, Herb. No. 75303;
Cape May, *Redfield* 1489, September 11, 1878, Herb. No. 75299, the plant marked B on this sheet;
Ocean County, *Mackenzie* 1028, September 16, 1904;
Pemberton, *Redfield* 3105, September 5, 1867, Herb. No. 75298;
Somerset County, *Perry*, date not given, Herb. No. 75321;
South River, *Mackenzie* 3780, August 23, 1908, Herb. No. 75315;
Without definite locality, *Beyrich*, date not given, Herb. No. 75295;
Without definite locality, *Beyrich*, 1833, Herb. No. 75296.

DELAWARE:
Ellendale, *Norton*, September 14, 1902, Herb. No. 75329;
Without definite locality, *Nuttall*, date not given, Herb. No. 75297;

PENNSYLVANIA:
Northampton County, *Rau*, 1880, Herb. No. 773853.

MARYLAND:
Caroline County, *Smith*, September, 1888, U. I. Herb.;
Snow Hill, *Norton*, September 13, 1902. Herb. No. 75328.

VIRGINIA:
Fortress Monroe, *Vasey*, 1879, Herb. No. 773808;
Munden, *Mackenzie* 1802, September 1–19, 1905;
Northwest, *Heller* 732, September 23, 1892, Herb. No. 75331.

I have not seen any specimens of EUTHAMIA TENUIFOLIA south of Virginia, all south of there that I have examined belong to other species. As described in the Illustrated Flora and Gray's New Manual, E. MINOR, formerly included in E. TENUIFOLIA, is an aggregate of several distinct species. Of the real E. MINOR, I have only seen the following:

NORTH CAROLINA:
Raleigh, *Ashe* 4632b, October, 1897, Herb. No. 75288;
Raleigh, *Ashe* 4632b, October, 1897, Herb. No. 75289;

The tall robust plant that Dr. Greene took to be the *Erigeron Carolinianus* of Linnaeus, seems to me to be very distinct from E. TENUIFOLIA, and to it I refer the following.

VIRGINIA:
Norfolk, *Jensen*, Autumn, 1906, Herb. No. 75322;
Norfolk, *Jensen*, Autumn, 1906, Herb. No. 75323.

Allied to E. TENUIFOLIA, but apparently distinct from it in the very small heads and narrow involucres, is a plant that Dr. Greene has described as E. MICROCEPHALA (or if a valid species, and to be referred to *Solidago*, SOLIDAGO MICROCEPHALA (Greene) Bush, n. comb.), of which I have examined the following.

SOUTH CAROLINA:

Aiken, *Ravenel*, September 26, 1886, Herb. No. 75305.

GEORGIA:

Without definite locality, but from the label and writing apparently collected by *Chapman*, ex N. Riehl Herbarium, date not given, Herb. No. 75318.

Related to the last, but differing from it in the scabrous pubescence and the pubescent leaves, is a plant described by Dr. Greene as E. SCABRA, a species of the interior, rather than the seacost. If it should prove to be a good species, and is transferred to *Solidago*, this plant will bear the name SOLIDAGO SCABRA (Greene) Bush, n. comb. I refer here the following:

FLORIDA:

Jacksonville, *Curtiss* 5314, October 26, 1894, Herb. No. 75330.

SOUTH CAROLINA:

Eutawville, *Eggleston*, 4998a, Sept. 6–11, 1909, Herb. No. 75327.

A species of the Southwest, E. PULVERNLENTA Greene, apparently extends eastward to Florida, if I am right in referring to it a specimen distributed by *Curtiss*. Should it be accepted as a valid species, and be placed in *Solidago*, it will bear the name SOLIDAGO PULVERULENTA (Greene) Bush, n. comb. I refer to it the following:

FLORIDA:

Jacksonville, *Curtiss* 1345, October, Herb. No. 75299, the plant marked A on this sheet.

Much of what has been referred to E. TENUIFOLIA and E. MINOR by collectors, apparently belongs to a species that Dr. Greene has described as E. MICROPHYLLA. It differs from both of those species in being taller, more robust, and in having narrower heads in a large fastigiate corymb. This seems so very distinct from E. MINOR, that I feel confident it will be accepted as a valid species, and should it be placed in *Solidago*, it will bear the name SOLIDAGO MICCROPHYLLA (Greene) Bush, n. comb.

I am referring to it the following:

NORTH CAROLINA:

Clarkton, *Biltmore Herbarium* 4632, October 7, 1897, Herb. No. 75286.

FLORIDA:

Apalachicola, collector not given, but apparently *Chapman*, date not given, Herb. No. 790839;

Apalachicola, collector not given, but apparently *Chapman*, date not given, Herb. No. 75284;

Apalachicola, collector not given, but apparently *Chapman*, date not given, Herb. No. 75285;

Braidentown, *Tracy* 7144, November 10, 1900, Herb. No. 75325;

Braidentown, *Tracy* 7144, November 10, 1900, Herb. No. 75326;

Dunedin, *Tracy* 7352, November 3, 1901, Herb. No. 75324;

Lake City, *Rolfs* 314, date not given, Herb. No. 75283;

MISSISSIPPI:

Ocean Springs, *Tracy* 4751, September 13, 1898, Herb. No. 75334.

ALABAMA:

Mobile, *Mohr* 1343, October, November, N. D. Herb. No. 5464.

Distribution of Our Birds in the Spring of 1917.

BY BROTHER ALPHONSUS, C. S. C.

In March the crow had 24 records, as many as those of the winter months. But in April there was a decided falling off, there being but 14 records for that month. This decrease was probably due to the habit of the species of usually retiring to outlying woods to breed, and seldom leaving the vicinity of the nesting site. In May there was a slight gain in the number of records—19, for then the young are fledged, and the old birds venture forth more frequently.

The Blue Jay had 23 records for March, which are slightly fewer than the average for the winter months. And the April records—21—almost equalled those of March, a fact that would indicate that the Jay's nesting time does not occur before the end of April. In May the records of this species were comparatively few—only 15 this year. The male is very devoted to the female during the breeding season, and seldom leaves the vicinity of the nest.

The Bronzed Grackle arrived somewhat late this year—on the 11th of March, making the number of records for that month—17—a great deal smaller than those of either of the other two spring months. April had 30 records and May, 29, and as this species is very abundant at Notre Dame, and nests not far from the houses, it may be seen daily during the breeding season.

The Red-winged Blackbird this year first appeared on the 20th of March, and was seen six times in the month after that date. In April there were 5 records, and in May, 12, which shows that this species was not abundant at Notre Dame in the Spring of 1917. In fact the Redwing is very locally distributed here, usually on the shores of St. Mary's Lake, where a few breed, and then leave for more marshy places to feed with their young.

The cowbird also arrived on March 20, and had 8 records in that month. There were 25 in April and 26 in May. This is an abundant species at Notre Dame from March until October. In Spring small flocks are often seen flying, in summer the young birds are mostly in evidence, and in autumn great flocks feed in the alfalfa fields. The Song, Field, and Chipping sparrows seem to be the most imposed upon by the Cowbird in our locality.

A few Song Sparrows stay with us in winter, and if the last days of February are fine, we always hear the first faint notes of this favorite song-bird. In 1917 there were 21 records in March, and 29 in April, and in May. I was absent from Notre Dame on the 10th and 11th of May, which accounts for the missing records of that month. This species is our most abundant sparrow, and wherever the observer may wander on our beautiful grounds, he can hardly ever get out of ear-shot of this sweet songster.

Although the Tree Sparrow is a winter species, yet it is never abundant, and is often absent for long periods. And as early March is sometimes very cold and snowy, this sparrow may not appear until the weather moderates. In the present year the first record in March was made on the 11th; the second, on the 18th, after which the species appeared frequently until the end of the month. Early in April the temperature fell lower than it had been during the last ten days of March, and the Tree Sparrow was not recorded again until the 18th, which was also the last spring record for the year. Strange to say, I did not hear the song of the Tree Sparrow once during the Spring of 1917.

The Field Sparrow often arrives in the latter part of March when the weather is moderating; and it must come in force, for almost daily records are made if the temperature remains high. This sparrow is in song from the date of migration, which makes it easy for the observer to tell how abundant the species is at any time in Spring. There was the same number of records for the Field Sparrow in April and May, 1917—22.

The Spring records of the White-breasted Nuthatch are always interesting to the student of bird life. Migrations of this species may occur for long or short periods, beginning even in winter. In 1917 this Nuthatch remained throughout March, which had 25 records. In April there were 11 records, the species being last seen on the 19th. There were 7 scattered records in May until the 14th, when the birds were seen no more. It is certainly difficult to account for all these periods of migration. Was the species breeding during its absence in April? I do not know, for I have not found a nest of the White-breasted Nuthatch in many years.

In March up to the 20th there were 6 records of the Chickadee. The next record was made on April 16, and another on the 18th. No others were made until May 7 and 11, the only two in that month. No doubt the rare appearance of the Chickadee in Spring

may be explained on the supposition that late in March this species begins to look about for a suitable nesting site, which is usually in some outlying wood, and any individuals that are seen after that time have wandered away from the breeding place. But this is only a supposition, and may not be the true explanation of the scarcity of a species that is most erratic in its movements.

During the first three weeks of March there were no records of the Brown Creeper, due probably to cold weather. The species first appeared on the 25th, and was seen three times after that date. In April the Creeper was abundant, as it usually is, having 20 records for that month. There were 10 records for May, and the species was last seen on the 14th.

In the Downy Woodpecker we have a very rare species in Spring. In March there were four scattered records—the 1st, 10th, 12th, and 28th. In April, three—the 3rd, 17th, and 24th. In May, one record—the 11th. These dates give a very adequate idea of the limited distribution of the Downy Woodpecker in Spring. My studies of this species have shown me that it is always very rare in winter and spring.

The Bluebird was recorded with considerable regularity both in March and May, but, as is usual with this species, it was most abundant in April. March had 19 records, April, 27, and May, 20. Not many Bluebirds breed at Notre Dame, although suitable boxes are plentiful enough.

The Robin usually arrives here in February—this year on the 23rd; but records are irregular for some time, so that it would be remarkable to find the species every day after its arrival. This year it was recorded daily after March 17th. The Robin is our most abundant species, breeding into August.

The records of the Meadowlark are somewhat scattered until about the last week in March. This year the species was seen daily after the 23rd, and the total for the month was 15 records. In April there were 27, and in May, 25. Some fields are more likely to contain Meadowlarks than others—outlying meadows seem to be the best places to find this lark.

The arrival of the Killdeer was a little late this Spring—March 11. After that date there were 13 records. In April this species reached its greatest abundance, there being for that month 21 records. There were 17 records in May, which points to the fact that this plover does not breed much earlier than most of our

other species. Late in June the old birds manifest great anxiety if their young are approached by an intruder upon their breeding grounds.

The records of the Snowbird in March were scattered up to the 19th, when the species was seen daily until the end of the month. In April the Snowbird reaches its maximum in distribution—the records this Spring being 29. Wherever an observer goes toward the middle of April he will be sure to flush flocks of Snowbirds. Even in May, for about a week, he will still find the birds, but not so numerous. This year the last Spring record of the Snowbird was made on May 8th.

In early Spring the Cardinal seems to be almost accidental here, for as typical of its rarity I may cite the few records of March and April 1917—two for each month. In May there were 9 records this year, which are sufficient to establish the fact that the Cardinal does not breed at Notre Dame. It merely flies from no great distance, probably from the banks of the St. Joseph River, or some deep woods, where it is breeding. In such places I hear the note of the Cardinal often.

In the Goldfinch we have a very irregular species in March and April, and even in the early part of May. This year there was a single record for March—the 19th. The species was not seen again until April 18th, when there followed five scattered records. In May no Goldfinches appeared until the 12th, when they must have come in force, for after that date the species was recorded daily.

The Kingfisher arrived March 30, 1917, and was not seen again until April 4. The records of this species are more or less scattered in Spring—April had 18, and May 17, this year. These figures show the relative abundance of the Kingfisher, which rarely breeds at Notre Dame. One nest was found this Spring.

A very remarkable record of the Purple Finch was made this Spring. The species arrived very early—on March 5—and had 8 scattered records for that month. Toward the end of April, Purple Finches became our most abundant species, large flocks feeding in low places on weed seeds. For this month there were 23 records; and 9 for May—one being so late as the 31st. The beauty of the rose-colored plumage and the sweet strain of the Purple Finch are one of the greatest delights of the bird lover.

The Phoebe is our earliest flycatcher—arriving this year on

March 23, and reappearing every day except the 26th. In the other Spring months the records of the species were scattered, as they usually are—19 for April, and 16 for May, This year I found only one pair breeding, in a grotto, where two broods were reared.

The Mourning Dove is one of our most abundant species. The date of migration for the dove this Spring was March 21, and twice again in that month it was seen. The April records totalled 25, and the May, 28. The Dove nests mostly in evergreens, but sometimes in deciduous trees or vines, and is not afraid to build near walks or houses where people frequently pass by. Often, singly or in pairs, the species is seen flying swiftly over fields.

The Vesper Sparrow usually arrives the last week in March or about the first of April. This year the date of migration was March 24, with records also on the 25th and 31st. This sparrow was most abundant in April, when it was found on 22 days. In May the weather was generally cool, and many of the birds became silent for days. The Vesper Sparrow being a species that frequents outlying fields, when its song is not heard the observer may not meet the bird. The records for May were 15.

The Flicker is usually the first of the migrant woodpeckers to arrive in Spring—this year on March 25. There were 5 other records in March, 27 in April, and 23 in May. These figures show the species to be abundant. The Flicker is a very conspicuous bird at Notre Dame, and far exceeds any of the other woodpeckers. For nesting places it prefers trees, poles, and even houses, boring holes in the walls.

The Golden-crowned Kinglet arrived on March 26, and was recorded daily for the rest of the month. It was also seen daily in April until the 6th, the period between these two dates marking the time of greatest abundance. The April records were mostly scattered, and totalled 21. This Kinglet was found in May on the 1st and 9th, and was last seen on the 11th.

My earliest record of the Brown Thrasher was made this year—on March 31. The species was next seen on April 13; then 3 scattered records followed until the 21st, and from this date the thrasher was seen daily. The bird was well distributed in May, there being 25 observations for that month. The song season of the Brown Thrasher lasted from April 13 to June 22.

The Hermit Thrush returned at about its usual time of arriving —this Spring on April 11. There were five scattered records until

the 25th, when daily observations were made up to the 28th. In May there was one long interval of absence between the 3rd and 13th. Two more records were made in this month—on the 14th and the18th. I have never heard the famous hymn-like note of this thrush.

The White-throated Sparrow arrived late this Spring—April 23; and after the 25th it was seen daily. In May this sparrow was observed irregularly until the 25th, and the total for the month was 15 records. While on a visit to Michigan City, Indiana—May 10-12—I found the White-throated Sparrow the most abundant species in Washington Park near the Lake.

The Yellow-bellied Sapsucker first appeared on April 2, and for most of this month it was very regularly distributed. The five records in May were all scattered, the two last occurring on the 16th and 24th, and the latter being a late date for the species. As compared with last Spring, I think the sapsucker was less abundant this year.

The Towhee was first observed on April 15—which was late—and next on the 17th; after the 24th records were made daily, amounting in all to ten. This species was quite regular in May, totalling 23 records. In Spring the Towhee does not retire to deep woods, as it does in summer.

The Chipping Sparrow was unusually early in its time of arriving this spring. The first record was made on April 4, followed by 5 scattered records up to the 19th. From the 21st to the 30th this sparrow was seen daily. The May records totalled 27, which show that this species is one that is exceptionally abundant during the nesting season. Some friends of mine who are expert ornithologists tell me that the Chipping Sparrow, strangely, is an exceedingly rare species in the Chicago area.

Our most common swallow is the Barn. This year it arrived on April 23, which is a little late, and appeared daily until the 30th. The records for May were all irregular, the species not being seen on any two consecutive days. The total for the month was 14 records. These observations were all made in the vicinity of no barn.

Some springs the Ruby-crowned Kinglet is a rare species, but this year for a while it was abundant. It arrived on April 16, and was recorded on ten days in that month. From April 27 until May 11, this kinglet was seen daily, and this was also the period of its

abundance. After the 11th of May the species was found twice—on the 16th and 23rd. Males, with ruby crowns, seemed to be rather uncommon this spring.

This spring the Spotted Sandpiper was first seen on April 21, which is one of the earliest dates of migration I have obtained for this species. After its date of arrival, the Spotted Sandpiper was seen on 8 days in April. The bird was quite regularly observed in May, and there were 26 records made in that month. Near lakes and rivers, this sandpiper is found in small numbers, and it often feeds in adjacent gardens.

The Chimney Swift arrived on April 29, and the next day a multitude of them were flying low above the damp fields. In May this species was recorded on 21 days. The Swifts are much in evidence for a month or more after their return. Especially in the evening just as it begins to grow dusk, they fly almost frantically above the many unused chimneys at Notre Dame.

The first appearance of the House Wren this spring was on April 19, which is an early date of migration. There were three more records in April, and 25 in May. This wren is very abundant at Notre Dame, and nests in boxes, in perpendicular pipes, and in deserted holes of woodpeckers. And as the second brood is not out till August, the song of the House Wren is heard all day long.

Catbirds seemed to be ususually abundant this year. First appearing on April 23, the species was seen 5 more times in this month. The May records, which totalled 25, were a little scattered until the 12th. There is so much shrubbery at Notre Dame, that it is no wonder that Catbirds are becoming so abundant. Even if the many cats here do secure some of the fledglings, there will be plenty left unharmed.

My latest date of migration for the Red-headed Woodpecker was obtained this spring—May 13. Some years it arrives in March, nearly always in April, And it even remained with us for two winters. Taking all these facts into consideration, it will be hard to explain the late arrival of the Red-headed Woodpecker in 1917. The total number of records for May was 16.

The Wood Pewee always arrives after the middle of May. This spring its silvery note was first heard on May 18, and then for eight consecutive days. For two days its plaintive song was missed, but on the 27th again the groves were vibrant with its

reiterated strain. The note of the Wood Pewee is easily the most pleasing of all our flycatcher's utterances.

The Kingbird's latest date of migration in Spring was recorded this year. It arrived on May 16, and was irregular in appearance until the 27th. After this date the kingbird was seen daily. This fly catcher is true to the name by which it is best known to farmers—bee-martin. Recently a gardener of my acquaintance told me that he shot a kingbird and found parts of 25 bees in its stomach. No wonder he carries a shot gun during his leisure time, looking for bee-birds.

The Crested Flycatcher was a little late in arriving this spring—on May 17. Most of the dates on which the species was observed in May were irregular, and the total number of records for the month was seven. The loud note of the crested Flycatcher, which resembles a whistle, is frequently uttered, and thus makes the presence of the bird known in any grove.

The Least Flycatcher arrived on May 18, and was irregular in appearance until the 25th, when the species was found daily for the rest of the month. I found the Least Flycatcher breeding for the first time in the Spring of 1917. In previous years my spring and summer records of the species were very few.

A very late date of migration this spring was obtained for the Baltimore Oriole, which usually arrives in the last week of April. I was in Michigan City on May 10, 11, 12, but I did not find this oriole while there. It was first seen at Notre Dame on the 10th of May, and next on the 12th. After the latter date, the Baltimore Oriole was observed daily until the end of the month. Eight days after the return of the bird, I saw a nest that was almost finished.

The Orchard Oriole arrived the same day as the Baltimore—May 10—but was more irregular throughout the month, the total number or records for this species being 10. It also seeks more secluded places for nesting, usually in orchards, where the nest is hidden from view. Of course the male sings joyously in the vicinity of the nest, and by careful observation of the birds the nesting-site may be discovered.

Besides the Hermit Thrush, which is always the earliest of the thrushes to arrive, records were made of the Olive-backed, Gray-cheeked, and Wood thrushes. The Olive-backed returned on May 17 and was seen daily until the 25th. It was last seen on the 29th. The Gray-cheeked was observed daily from its arrival on the 22nd

of May until its departure on the 30th. One record was made of the Wood Thrush—on May 17. The notes of none of these thrushes were heard.

Five scattered records of the Cedarbird were made after the 11th of May, when the species was first observed this spring. I found these birds in the sand dunes near Michigan City, Indiana, while on a trip with members of the Indiana Audubon Society. The Cedarbirds always feed in small flocks, and their presence may be readily detected by their weak but oft-repeated note. In fact these birds are usually heard overhead in trees before they are seen.

The beautiful Indigo Bird was first seen this spring on May 18, which is a late date for the species to arrive. In other years I have found the bird as early as May 4. This spring the Indigo Bird was in song on the first day it appeared. For a long time the song is not full and sweet, as it is in summer. The female of the species is brown and will puzzle beginners who may not know the sharp call-note. Often the birds are together in pairs, and the blue male will afford a hint as to what the brown bird is. There were 13 records of the Indigo Bird in May, and most of them were regular.

The Myrtle Warbler is our first warbler to appear in spring—arriving this year as early as April 11. For the rest of the month the records were irregular until the 25th, when the species was seen daily. In May there were 22 records, most of them regular up to the 19th, when they again became scattered. The last day the Myrtle Warbler was seen was on June 3, which is my latest spring record for the species.

The writer having previously published an article in the AMERICAN MIDLAND NATURALIST on our warblers, thought it unnecessary to treat again the various species that were seen this spring. The records of their migration and distribution may be found in the table appended to this article. Suffice it to say that some of the warblers did not leave here until early June, and in a later production the dates of their migration will be given. These late warblers were: Myrtle Warbler, Magnolia Warbler, Redstart, Canada Warbler, Wilson Warbler, Chestnut-sided Warbler, Black-poll Warbler, Tennessee Warbler, Northern Parula Warbler, Black-throated Green Warbler, Blackburnian Warbler, Bay-brested Warbler.

Certain rare species have not been described in the text of the present article, for its chief purport is their distribution. Among these the Henslow's Sparrow, Northern Parula and Golden-winged warblers were seen by the writer for the first time.

MARCH

Crow, 1 to 6, 8 to 12, 13 to 20, 24 to 27, 30.
Blue Jay, 1 to 4, 6 to 12, 17, 19 to 26, 28, 30, 31.
Bronzed Grackle, 11, 12, 15, 17, 19 to 31.
Red-winged Blackbird, 20, 22, 23, 24, 29, 30.
Cowbird, 20, 21, 23, 24, 26, 28, 30, 31.
Song Sparrow, 2, 3, 6, 7, 10, 11, 13, 15, 19, 20 to 31.
Tree Sparrow, 11, 18, 20, 21, 22, 23, 25, 29.
Field Sparrow, 25, 26, 28 to 31
White-breasted Nuthatch, 1 to 5, 10 to 16, 19 to 31
Chickadee, 2, 3, 15, 17, 18, 20
Brown Creeper, 25, 28, 30, 31.
Downy Woodpecker, 1, 10, 12, 28.
Sapsucker, 30.
Bluebird, 2, 6, 9 to 12, 15, 19 to 28, 30,31.
Robin, 2, 3, 4, 7, 9 to 12, 14, 15, 17 to 31.
Meadowlark, 6, 9, 11, 14, 15, 19, 20, 21, 23 to 31.
Killdeer, 11, 12, 14, 17, 18, 20 to 23, 26, 28, 30, 31.
Snowbird, 5, 11, 12, 13, 15, 18, 19 to 31.
Red-poll, 11.
Cardinal, 22, 26.
Herring Gull, 13
Goldfinch, 19.
Purple Finch, 5, 11, 15, 23, 26, 28, 29, 31.
Tufted Titmouse, 28, 30.
King Fisher, 30.
Phoebe, 23, 24, 25, 27 to 31.
Mourning Dove, 21, 22, 30.
Vesper Sparrow, 24, 25, 31.
Flicker, 25, 26, 28 to 31.
Red-shouldered Hawk, 19.
Golden-crowned Kinglet, 26 to 31.
Brown Thrasher, 31.

Total number of species seen, 32.

APRIL

Crow, 4, 5, 7, 12 to 16, 18, 19, 22, 24, 28, 29.
Blue Jay, 1, 3, 4, 5, 7, 10 to 15, 17, 18, 19, 22 to 27, 29.
Bronzed Grackle, 1 to 30.
Red-winged Blackbird, 1, 9, 17, 27, 29, 30.
Song Sparrow, 1 to 5, 7 to 30.
Cowbird, 1, 3, 4, 5, 8 to 13, 15 to 19, 21 to 30.
Tree Sparrow, 18.
Field Sparrow, 1, 3, 4, 6, 7, 10, 12, 14 to 19, 21 to 30.
Vesper Sparrow, 2, 3, 4, 7, 8, 10, 11, 12, 14 to 19, 21 to 24, 26, 27, 28, 30.

White-throated Sparrow, 23, 25 to 30.
Henslow's Sparrow, 18.
White-breasted Nuthatch, 1 to 4, 6, 7, 11, 12, 14, 18, 19.
Chickadee, 16, 18.
Tufted Titmouse, 18.
Brown Creeper, 1, 3, 7, 9 to 13, 15, 17 to 20, 23 to 29.
Downy Woodpecker, 3, 17, 24.
Sapsucker, 2 to 5, 9 to 19, 22 to 26, 28, 29.
Hairy Woodpecker, 7.
Flicker, 1 to 12, 14 to 19, 21 to 26, 28, 29, 30.
Bluebird, 2 to 19, 22 to 30.
Robin, 1 to 30.
Meadowlark, 2 to 5, 7, 9, 10 to 30.
Killdeer, 2, 3, 4, 9, 12, 14 to 19, 21 to 30.
Snowbird, 1 to 19, 21 to 30.
Cardinal, 9, 19.
Herring Gull, 16.
Goldfinch, 18, 27, 28, 29, 30.
Hermit Thrush, 11, 12, 13, 17, 23 to 28.
Mourning Dove, 2, 3, 4, 6, 7, 9 to 12, 14 to 19, 21 to 30.
Purple Finch, 1, 3, 7, 9 to 13, 15 to 19, 21 to 30.
Kingfisher, 4, 5, 7, 8, 10, 11, 15, 16, 18 to 21, 24 to 28, 30.
Golden-crowned Kinglet, 1 to 6, 9, 11, 12, 13, 15, 16, 17, 19, 21, 22, 23, 25 to 28.
Phoebe, 1 to 5, 8, 11 to 16, 20, 22, 23, 25, 27, 28, 29.
Brown Thrasher, 13, 16, 18, 19, 21 to 30.
Towhee, 15, 17, 18, 19, 24 to 30.
Chipping Sparrow, 4, 7, 8, 10, 11, 12, 15 to 30.
Barn Swallow, 23 to 30.
Tree Swallow, 13.
Ruby-crowned Kinglet, 16 to 19, 22, 23, 27 to 30.
Spotted Sandpiper, 21 to 25, 27, 29, 30.
Chimney Swift, 29, 30.
Myrtle Warbler, 11, 12, 14, 15, 18, 19, 23, 25 to 30.
Palm Warbler, 24, 26, 27.
Black-throated Green Warbler, 28.
House Wren, 19, 21, 23, 24, 30.
Carolina Wren, 18.
Winter Wren, 26, 27, 28.
Catbird, 23, 25 to 29.
Wilson Snipe, 30.
Blue-winged Teal, 30.
Scaup Duck, 30.
American Golden-eye, 30.
Purple Martin, 30.
Sparrow Hawk, 22.

Total number of species seen, 55.

MAY

Crow, 2, 4 to 7, 11 to 14, 16, 17, 19, 21 to 25, 27, 31.
Blue Jay, 3, 5, 7, 11, 12, 14 to 17, 20, 23, 24, 26, 27, 31.
Bronzed Grackle, 1 to 9, 12 to 31.
Red-winged Blackbird, 1, 11 to 15, 17, 19, 20, 24, 29, 31.

Downy Woodpecker, 11.
Snowbird, 1, 2, 3, 6, 7, 8.
Cowbird, 1, 2, 4 to 9, 12 to 17, 19, 20, 22 to 31.
Song Sparrow, 1 to 9, 12 to 31.
Field Sparrow, 1 to 7, 9, 12, 12 to 15, 17 to 22, 24, 29, 31.
Vesper Sparrow, 1, 2, 3, 6, 7, 9, 12 to 15, 17, 19, 20, 24, 31.
White-throated Sparrow, 2, 3, 4, 11 to 17, 20, 22 to 25.
White-crowned Sparrow, 23.
Swamp Sparrow, 15, 16, 17, 24.
Chipping Sparrow, 1 to 9, 11 to 17, 19 to 25, 27, 28, 29, 31.
Grasshopper Sparrow, 31.
White-breasted Nuthatch, 2, 3, 4, 5, 7, 13, 14.
Red-breasted Nuthatch, 11, 16, 19, 31.
Chickadee, 7, 11.
Brown Creeper, 1, 3, to 9, 11, 14.
Sapsucker, 2, 3, 7, 16, 24.
Red-headed Woodpecker, 13, 14, 16 to 27, 29, 31.
Hairy Woodpecker, 18.
Flicker, 1, 2, 3, 6 to 9, 11 to 15, 17, 19, 22 to 27, 29, 30.
Bluebird, 1 to 7, 9, 11, 14 to 18, 21, 24, 25, 28, 29, 30.
Robin, 1 to 31.
Meadowlark, 1 to 9, 11 to 16, 18 to 24, 28, 29, 31.
Killdeer, 1, 3, 5, 6, 8, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 26, 31.
Cardinal, 6, 8, 14, 15, 17, 19, 20, 27, 31.
Herring Gull, 4, 11.
Goldfinch, 1, 12 to 31.
Purple Finch, 1, 2, 3, 6 to 9, 16, 31.
Kingfisher, 1, 2, 3, 6, 7, 8, 9, 14, 15, 19 to 22, 25, 27, 30, 31.
Golden-crowned Knight, 1, 9, 11.
Ruby-crowned Knight, 2 to 11, 16, 23.
Brown Thrasher, 1 to 9, 12 to 17, 19, 20, 22 to 25, 27, 28, 29, 31.
Catbird, 2, 3, 4, 7, 9, 12 to 31.
Towhee, 2 to 8, 11 to 15, 17 to 24, 27, 28, 31.
Barn Swallow, 2, 3, 4, 7, 8, 9, 12, 16, 18, 19, 22, 25, 26, 31.
Tree Swallow, 8.
Rough-winged Swallow, 20, 26
Phoebe, 1 to 9, 11, 13, 15, 17, 20, 28, 29.
Wood Pewee, 18 to 25, 27 to 31.
Kingbird, 16, 17, 19, 21, 22, 24, 25, 27 to 31.
Crested Flycatcher, 17, 18, 22, 25, 26, 28, 31.
Least Flycatcher, 18, 19, 21, 22, 23, 25 to 31.
Alder Flycatcher, 28, 29.
Yellow-bellied Flycatcher, 28, 29, 31.
Spotted Sandpiper, 2 to 9, 13 to 30.
Solitary Sandpiper, 8, 12, 16
Mourning Dove, 1 to 9, 11 to 28, 31.
Purple Martin, 11, 13, 14, 17, 19, 29, 31.

Lesser Yellowlegs, 9.
Sparrow Hawk, 4, 5, 24.
Red-shouldered Hawk, 11.
Chimney Swift, 6, 7, 8, 12, to 17, 20 to 31.
Winter Wren, 2, 13.
House Wren, 3, 7, 8, 9, 11 to 31.
White-eyed Vireo, 2, 7, 20.
Warbling Vireo, 13 to 18, 19, 20, 22 to 31.
Hummingbird, 23, 24, 27, 28.

MAY

Red-eyed Vireo, 17, 19, 23, 24.
Blue-headed Vireo, 17, 19.
Yellow-throated Vireo, 19, 21.
Pine Siskin, 2, 9, 14, 17, 18, 29
Bobwhite, 1.
Dickcissel, 20, 21, 24, 28, 29, 31.
Black-billed Cuckoo, 19.
Baltimore Oriole, 10, 12 to 31.
Orchard Oriole, 10, 16, 17, 19, 20, 21, 23, 24, 25, 29, 31.
Hermit Thrush, 3, 13, 14, 18.
Olive-backed Thrush, 17 to 25, 29.
Gray-cheeked Thrush, 22 to 31.
Wood Thrush, 17.
Cedarbird, 11, 15, 27, 29, 31.
Rose-breasted Grosbeak, 11, 23, 25, 27.
Whip-poor-will, 16.
Night Hawk, 28, 30.
Indigo Bird, 18 to 21, 23 to 31.
Myrtle Warbler, 1 to 7, 9, 11, 14 to 19, 21, 22, 23, 25, 26, 28, 29.
Yellow Warble, 11, 14 to 18, 20 to 23, 28, 29, 31.
Pine Warbler, 3, 14, 16.
Palm Warbler, 12 to 20, 22, 25.
Black-throated Green Warbler, 13, 16 to 21, 25, 27 to 31.
Nashville Warbler, 16, 17, 26, 31.
Yellow Palm Warbler, 16, 17.
Black and White Warbler, 11, 15, 16, 17, 19, 22.
Maryland Yellowthroat, 17, 19, 20 to 23, 25 to 28, 31.
Blackburnian Warbler, 17 to 24, 31.
Cap May Warbler, 17, 23, 25, 26.
Redstart, 16, 17, 18, 21, 22, 24 to 31.
Magnolia Warbler, 16, 17, 19, 20, 22 to 31.
Black-throated Blue Warbler, 16, 17, 21, 28.
Canada Warbler, 24, 27, 28, 29, 31.
Wilson Warbler, 24 to 31.
Oven-bird, 14, 16, 17, 23, 24, 26, 28.
Chestnut-sided Warbler, 16 to 24, 27 to 31.
Black-poll Warbler, 18, 19, 20, 22, to 25, 28, 29, 31..
Tennessee Warbler, 17, 19, 27, 30.
Bay-breasted Warbler, 16, 19, 20, 23, 29, 30, 31.
Northern Parula Warbler, 15.
Golden-winged Warbler, 16.

Total number of species seen in May, 101.
Total number of species seen this spring, 109.

The Collecting, Drying and Mounting of Plant Specimens.

BY J. LUNELL.

Botanical manuals usually furnish ample and excellent advice how to prepare plants intended for permanent preservation, and my only excuse for what some would consider wasting printer's ink on this topic is that I wish to emphasize a few points which hitherto perhaps have not attracted the widespread attention they no doubt deserve.

The living plant is directly a production of nature, but a herbarium specimen is natural only in a modified form, and partly an art production. It is well to look at this matter from an esthetical point of view. Nature is always beautiful, even in disease, decay and death. An art production of a plant, be it the very plant or an imitation of it in clay or paint, becomes the more valuable the nearer it comes to its natural living model. In order to reach our goal, the end of all our efforts should therefore be to retain unchanged the likeness of the living plant. Botanists with a congenital sense for art as a rule produce acceptable plant specimens. By care and study they will effect approach to perfection. It is worth mentioning on the other hand that a not inconsiderable class of botanists indulges in the cynical habit of amassing material, no matter if it is good or poor, perhaps not even realizing the difference in qualities; we would feel inclined to call this special brand of botanists *plant butchers*. The large herbaria have an aim to pile up rich and varying material for the furtherance of scientific study, and beauty seems for the most part only to be a secondary matter with them.

Herborizing or *Collecting*. It is important to select beautiful and well developed plants, neither too large nor too small, and by all means to avoid thick and bulky material. Efforts should be made to secure entire subterranean parts, shoots, etc. Some writers advise the collection of three small plants or of two middle-sized to make up a specimen. The correct way is, I think, to collect enough for filling the sheet, but never to crowd it. The number of plants is immaterial. For large herbs, shrubs and trees the same rule holds. From the important parts enough is secured to fill the sheet (or sheets, if necessary). The connection between a parasitical plant and its host should not be severed. Night-blooming

plants, like some *Silene, Anogra*, etc., ought to be collected whenever the flowers are open: have a portfolio with bibulous paper ready, and expand the plants quickly between the sheets, applying the needed pressure immediately. This method ought to be used always when plants are inclined to collapse as soon as they are separated from the ground. Delicate parts can thus be satisfactorily and sufficiently expanded at once, when it would require hours to disentangle them when collapsed, for example *Capnoides, Papilionaceae*, etc., especially their leaves. To make the petals of *Alisma subcordatum* Raf. discernible after drying, one must insert them carefully between the sheets in the portfolio and apply considerable pressure *before* digging the plant out of the ground. Aquatic plants have to be spread out on paper beneath the surface of the water. To grasses the fibrous root-system is indispensable and ought always to be exhumed, as the separated parts are very undesirable and unseemly. If the collector is a poor swimmer, especially below water, and the water is deep, it is perhaps recommendable to employ a proxy for digging our deep-water plants from the bottom. Dioiccous plants ought to be represented by staminate and pistillate aments, and in *Salices* the full-grown leaves, which appear with the winterbuds in the fall, will complete the specimen. Thick plants ought to be thinned with a knife.

The *drying* and *pressing*. Our aim is here to eliminate the third dimension as completely as possible, and the pressure applied merely ought to be short of crushing the parts. The plants already resting in the portfolio ought to be moved with their enveloping sheets into the press, and faulty arrangements, as doubled leaves, petals unsymmetrically disposed, etc., corrected. Plants from the collecting box have to be placed on sheets of paper, and all parts expanded and arranged *lege artis* in free-standing positions, so that no part is resting on and hiding another. Roots, stems, etc., have to be pared with a knife, in order to equalize the thickness of the specimen through all its parts as much as possible. When the length of the plant exceeds the length of the sheet, the stem has to be bent in an angle not in a curve, this bending to be repeated as many times as needed. In folding, the legs of the angle should come in the same plane, and the legs not allowed to rest one on top of the other at their junction and thus get their thickness doubled. With tall plants commence at a lower corner of the sheet and at the root of the plant, proceed to the upper corner on the same

side, make the bend, and so on. Do not forget to bring in view in the first place parts presenting the differential characters of the species. See that a fastigiate branch has its proper direction when leaving the stem, as well as a divergent one. Do not allow a left hand branch to cross the stem and crowd the right hand ones, and vice versa. This would increase the bulk on the usually thickest part of the plant above the ground. As hinted at above, an ideal arrangement will equalize the thickness over all parts of the specimen.

Dispose all parts artfully. The lower side of a leaf ought to be turned up, in order to demonstrate the appearance of this side. When leaves have to be in contact with stem or branches or floral parts, do always place the latter on top of the leaves.

Plants with thick, juicy leaves like most *orchids* or *Crassulaceae* ought to receive a hasty immersion in boiling water (for 30–60 seconds or longer), and some common salt added to the water will brighten the green color. The steaming of the parts is perhaps a preferable method. Whichever process is used, the flowering parts ought to be protected from the treatment.

Use paper capable of absorbing an excess of moisture, change it often and dry in the sun or in an oven. In the southern states it is usual to expose the press to the sun and the hot sand, which usually make a perfect work in the course of a day, but in most of the other states such a method would be insufficient and would, completely spoil the specimens, if these were left without further attention in the press until dry. The neglect of changing paper gives to the plants a resemblance of hay repeatedly soaked by rain and turns them black at last. It is good that so many plants contain such a moderate amount of moisture and thus are able "to press themselves," if they only are thrown between two papers and get a weight on them. Such plants are the redeeming feature in many herbaria which else would be considered beyond help in the eyes of the lover of the beautiful.

A good specimen is apt to stay permanently with its first receiver. An ugly one has often a future of extensive travelling not seldom sailing around the world a few times, everywhere creating disgust, dissatisfaction and disappointment. It would be of doubtful benefit even to have fine or jail sentences imposed on its progenitor, in order to check such a criminal tendency. It may cause a sensation of ease and relief to its temporary possessor, when it

has been successfully unloaded on some innocent victim. Incessantly on the tramp, it falls usually at last into the hands of some merciful, true philanthropist, who, out of compassion with suffering humanity, cremates it, hoping that from its ashes shall rise some new lovable form of life.

The *mounting*. Affix the plant to the herbarium paper by means of narrow strips of surgeon's silk plaster or of japanese glued paper. To apply glue directly to the plant and make it adhere permanently to its supporting sheet is not commendable. Plants ought to be fastened so that they can be easily removed and their places filled with better specimens whenever such occasions offer themselves. Let it always be your aim with the mounting to cover the entire surface of the sheet, no matter how many individual plants are needed. My specimen of *Cerastium nutans* contains 24 plants, of *Gentunculus minimus* 36. One or two, or even eight or ten plants on a sheet give the impression of loneliness and poverty, when 21 is the right number. Our enemies, the Germans, appreciate filled sheets in their own peculiar expression when they ask for exchange sheets *wohl aufgelegt*. Empty places, not otherwise fillable, could be occupied advantageously by single flowers, which will often display themselves gorgeously, but this suggestion ought not to be made use of too often, as everything becomes tiresome when overdone.

A trashy heap of disgusting material can often be made over and remarkably improved by steaming, which enables us to unfold the parts, straighten them out and mount them successfully.

Whenever feasible, place the thicker parts near the sheet margins with the widest possible variety of locations: one root in the left upper corner, another one an inch or more lower down on the left margin beneath, etc., in order to give to the piled sheets an equal thickness centrally, peripherally and all through. By this method and by avoidance of bulk in all forms within your power, there results a remarkable saving in space. And space is valuable indeed. At least it ought not to be squandered in order to make plant specimens ill-looking. I sent out once an exchange package of 100 specimens having a thickness in all its parts of 2 inches. The return package, also of 100 specimens, measured 7 inches in the medium line and 2 inches on the margins, and the pile resembled the vault of a gothic dôme.

An all-important matter is also the symmetrical disposition

of the plants on their sheets according to the laws of the beautiful. The writer used for years to exchange with a renowned institution. Its plants were widely above reproach and of the most desirable quality. I made their mounting esthetically correct, and the result was a set of specimens unsurpassed and perhaps unequalled by any other set of its ilk in the whole world. Later it was my good luck to acquire a set mounted at home before it left the institution. The preparation of the plants themselves evidently showed the master's hand, but their arrangement on the sheets was unexpectedly and astonishingly faulty. In a number of instances they had been crowded in the corner of the sheet, many of them were laid in a pile and held in place by a strip of plaster like a bouquet of flowers, and other specimens had their peripheral parts extending outside of the sheet margins, leaving them utterly unprotected against mechanical injuries. The mounting hand had not been governed by a spirit impressed with a sense for the beautiful.

Three decades of building up an herbarium have been fruitful to me with varied experiences. When exchanging I used to suggest to my correspondents three rules: (1) The specimens ought to retain their natural colors as truly as possible; (2) they ought to have all the parts laid out and expanded with a painstaking accuracy; and (3) the sheets ought to be filled. Most responded lavishly, and some even sent me more beautiful specimens than they kept for their own herbaria. A few persisted tenaciously in transmitting poor material, and as a last resort I returned to them specimens prepared according to their own methods. This helped, and at last I had all "trained." All had only acceptable material to offer me.

Poor specimens were kept by me only temporarily, until I had acquired better ones, and I exchanged certain plants dozens of times until I finally had a good specimen of each.

The effects of these procedures on my herbarium are easily understood. There exist numerous herbaria exceeding mine in their numbers of specimens, but none outrivals or equals it in the beauty of the *entire* collection! In the heat of disputes I have often been called a "crank," but the opposition has always turned in my favor.

I trust that the reader of these lines will pardon me for expressing a deeper interest in aforesaid topics than he perhaps considers them deserving.

Leeds, North Dakota.

The Invasion of a Missouri River Alluvial Flood Plain.

BY HERBERT C. HANSON.

INTRODUCTION

An interesting invasion of an alluvial bank, formed in the spring of 1916 by the Missouri river, near Peru, Nebraska, was studied during August and September, 1916. The vegetation on new land formed by river or lake activity has been the theme of several writers and is summarized by Clements (2). The plants mentioned in this article were named according to the second edition of Britton and Brown's Illustrated Flora. The identification of difficult species was verified by comparison with preserved specimens in the herbarium of the University of Nebraska.

DESCRIPTION OF THE ALLUVIAL BANK

The Missouri river, colored yellow by the enormous load of fine soil carried in suspension, overflows its banks every spring. As the flood recedes great quantities of silt, clay and sand, besides trees, logs, brush and herbaceous plants are deposited on the flood plain. An area, about half a mile long and varying in width from about fifty feet to several hundred feet, forming the bank on the Nebraska side of the river, was denuded of vegetation by the spring flood of 1916. Most of the area was approximately flat, in some places sloping gently to the river's edge, in other places forming a vertical bank of three to five feet.

The soil was very fine, composed of a mixture of fine sand, silt and clay. Frequently, scales formed on the surface and cracks from six inches to thirty inches deep, and up to six inches wide, formed in the more clayey soil.

THE INVASION

1—BRUSH PILES

Logs, brush and other debris were scattered over the bank after the water had receded. Fruits, seeds, roots, rootstocks, stems, and, in places, entire plants were held by the brush, giving rise to clumps of vegetation.

Equisetum was usually restricted to these brush piles, growing from rootstocks. Willows, growing from roots and stems, were also common. Other plants found growing in the brush were

Cyperus erythrorhizos, Persicaria lapathifolia, Bidens frondosa, B. cernua, Xanthium commune, Panicum dichotomiflorum, Chaetochloa glauca, Scirpus validus, Acnida tuberculata, and *Echinochloa crus-galli.*

2.—WATER LEVEL ZONES

Figure 3 illustrates how sticks and other brush were deposited on the shore just beyond the reach of the waves.

The seeds and fruits caught in the brush were so abundant that they could be gathered by the handful. As the flood water receded new water levels were formed. The duration of the water at a certain level determined, largely, the amount of brush and seeds deposited at that level. The number of seeds deposited determined the width and the density of the vegetative zone formed from the germination and growth of the seeds at the water level. This accounts for the variation in the number of plants in the various zones as shown in figure 4.

The number of vegetative zones on the area varied according to the degree of slope. Where the slope was gradual, as in figure 4, as high as 15 zones were found; but where the slope was vertical no zones were found. The most abundant plant in these zones was *Cyperus erythrorhizos.* The brown color of this species caused the zones to form a striking contract with the light gray of the soil. *Bidens frondosa* and *B. cernua* were also abundant. The following plants occurred frequently; *Radicula palustris, Verbesina alba, Strophostyles helvola, Salix interior, S. cordata, Persicaria pennsylvanicum* and *Potentilla paradoxa.*

3.—LEVEL AREAS.

The vegetation of the level areas varied considerably. In some places seedling willows and poplars were abundant, and various grasses and herbs occurred sparingly among them. In other places willows, grasses and herbs, but no poplar, were found.

In other places only herbs and grasses were growing. (Fig. 1.) The absence of willows or poplars on certain areas is due to the fact that these areas were still covered by water when the seeds of these trees were migrating. On the more sandy areas were found usually: *Eragrostis hypnoides, E. purshii,* and *Panicum capillare.* Other plants occurring on the leves areas were *Cyperus erythrorhizos, Bidens cernua, B. frondosa, Radicula palustris, Panicum dichotomiflorum, Rumex crispus, Persicaria lapathifolia, P. Pennsylvanica,*

and *Potentilla paradoxa*. The walls of the large cracks in the more clayey areas were frequently covered with a green lining of *Vaucheria* and various diatoms. A species of *Riccia*, a flat, circular, well-rooted plant, was usually the first to grow on the newly exposed land.

Table 1. Showing the plants found growing on the alluvial bank, their abundance, their location and the kind of propagule.

SPECIES	ABUNDANCE	OCCURRENCE	PROPAGULE
Cyperus erthrorhizos Muhl	very abundant	zones brush level areas	achene
Bidens frondosa L.	abundant	zones brush level areas	barbed awn achene
Bidens cernua L.	very abundant	zones brush level areas	barbed awn achene
Strophostyles helvola (L.) Britton.	very rare	zones	pod seed
Scirpus validus Vahl.	infrequent	brush	rootstock achene
Eragrostis hypnoides (Lam.) B.S.P.	infrequent	sandy areas	grain
Eragostis purshii Schrad.	frequent	level areas	grain
Chatochloa glauca (L.) Scribn.	infrequent	brush	grain panicle
Radicula palustris (L.) Moench	abundant	zones level areas	pod seed
Panicum capillare L.	infrequent	level areas	grain panicle
Panicum dichotomoflorum Michx.	infrequent	brush level areas	grain
Verbesina alba L.	infrequent	zones	achene
Persicaria lapathifolia (L.) S. F. Gray	infrequent	brush level areas	achene
Persicaria pennsylvanica (L.) Small.	frequent	zones level areas	achene
Acnida tuberculata Moq.	very rare	brush	utricle seed
Echinochloa crus-galli (L.) Beauv.	infrequent	brush	grain

Potentilla paradoxa Nutt.	rare	zones level areas	achene
Xanthium commune Britton	very rare	brush	spiny bur achene
Rumex crispus L.	frequent	zones level areas	winged achene
Equisetum sp.	infrequent	brush	spore rootstock
Vaucheria sp.	abundant	cracks	filament spore
Diatoms	abundant	cracks	entire plant spore
Riccia sp.	abundant	moist soil	entire plant spore
Salix interior Rowlee.	very abundant	level areas brush zones	entire plant stem, root seed
Salix cordata Muhl.	rare	zones	stem root seed
Populus deltoides Marsh.	frequent	level areas zones	seed

SUMMARY.

1. The invasion of an alluvial bank formed by the Missouri river, near Peru, Nebraska, was studied during August and September, 1916.

2. The soil of this bank consisted of a mixture of very fine sand, silt and clay.

3. Deep cracks occurred frequently in the clayey part. *Vaucheria* and diatoms often grew on the moist, shaded walls of these cracks.

4. The agents of invasion were water, wind and possibly under certain conditions, birds and other animals.

5. The first plant, usually, to grow on the new land was a *Riccia*.

6. Seeds and fruits, deposited with the brush at the water levels as the flood water receded, formed well-defined zones.

7. As the water receded from the level areas, seeds and fruits were left scattered on the wet soil, giving rise to a very open form of vegetation. This open vegetation was broken in places by piles

of brush. Growing from the seeds, fruits, roots, stems and entire plants, which were held by the brush, were found the largest plants on the bank.

8. Seeds of willow and poplar were carried in by the wind.

9. The order of the succession after the recession of the water was *Riccia*———>ruderal herbs and grasses———>seedling willows and poplars———>zone of young willows and poplars ———>flood plain forest of willows, poplars, and some elm, ash and sycamore.

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3. Elmore, C. J. The first year's flora of a dried-up mill-pond. Proc. Nebr. Acad. Sci. 7; 29. 1901.

4. Soil survey of Nemaha County, Nebraska. Bur. of Soils, U. S. Dept. of Agric. Washington, D. C. 1916.

DESCRIPTION OF FIGURES.

FIG. 1.—Deep cracks in alluvial clay caused by the evaporation of water. *Persicaria Pennsylvanica, Radicula palustris, Rumex crispus,* and *Bidens cernua* are the more common plants. *Vaucheria* and diatoms form a green lining over the damp walls of numerous cracks.

FIG. 2.—Plants growing from seeds, fruits, stems, roots, or entire plants caught by the brush. *Salix cordata* in background and *S. interior* in foreground growing from branches. *S. interior* in center from a root. The other plants are *Panicum dichotomiflorum, Equisetum* at extreme right growing from rootstocks, *Persicaria lapathifolia, Bidens frondosa,* and *Xanthium commune.*

FIG. 3.—Showing the deposition of brush on the shore just beyond the reach of the waves. Large quantities of seeds and fruits were held in the brush.

FIG. 4.—The seeds, deposited as shown in Fig. 3., have given rise to these water level zones. The most abundant plants are *Cyperus erythrorhizos, Bidens cernua,* and *B. frondosa.* Other plants are *Salix interior, Populus deltoides, Rumex crispus, Verbesina alba, Radicula palustris* and *Potentilla paradoxa.*

FIG. 5.—Showing the vegetation on a level area of an alluvial bank in Sept., 1916. Willow seedlings are the most abundant plants. The dark-colored plant is *Cyperus erythrorhizos*. The light-colored plant is *Eragrostis purshii*.

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Plants of Blue Rapids and Manhattan, Kansas.----Corrections and Index to Common Names.

BY O. A. STEVENS.

Corrections.

Page 73 to 87, heading, for Blue Island, read Blue Rapids.
" 73 line 18, insert period after Link.
" 74 " 27, for *halepense*, read *Halepense*.
" 75 " 9, " *scribnerianum*, read *Scribnerianum*.
" 75 " 13, " glauca, read *glauca*.
" 77 " 1, " Oast, read Oats.
" 77 " 18, " *Schrad.*, read Schrad.
" 79 " 11, Add: June 10.
" 81 " 29, for *officinale*, read *officinalis*.
" 82 " 16, " Places, read places.
" 84 " 31, " *patientia*, read *Patientia*.
" 87 " 30, " Ranunculus, read *Ranunculus*.
" 98 " 6, " *Willd.*, read Willd.
" 100 " 21, " *occidentolis*, read *occidentalis*.
" 101 " 3 from bottom, for 25 (23), read 20 (19).
" 101 " 19, for *Amygdalius*, read *Amygdalus*.
" 102 " 25, " *floribnnda*, read *floribunda*.
" 103 " 25, " *grandflora*, read *grandiflora*.
" 103 " 33, " 25 (23), read 20 (22).
" 104 " 9, " (L. 1), read (L.).
" 115 " 14, " *L.*, read L.
" 115 " 27 and 29, for *Penstemon*, read *Pentstemon*.
" 117 " 12, for *L.*, read L.
" 117 " 6 from bottom, for *Cucurflta, read Cucurbita*.
" 119 " 13, insert at beginning: Manhattan.
" 120 " 2, for Aug. 16, read Aug. 15.
" 120 " 5, " sometime, read some time.
" 122 after line 22 insert: *Bidens acuta* (Wiegand) Britton. Riverbanks. Common.
" 124 line 32, for *Halpense*, read *Halepense*.
" 124 add at bottom of page: *Potamogeton foliosus* Raf.
" 128 line 8 from bottom, for D. C., read DC.

Index

Fig. 3

Fig. 5

PLATE II.--Hanson on Invasion of a Missouri River Alluvial Flood Plain.